United Nations A/62/88

General Assembly

Distr.: General
8 June 2007

Original: English

Sixty-first session
Agenda item 119
Follow-up to the outcome of the Millennium Summit of the sixty-second session of the United Nations General Assembly

Letter dated 5 June 2007 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

I have the honour to transmit China's National Climate Change Programme released on 4 June 2007 by the Chinese Government, which reflects China's policies as well as the actions to be taken to address climate change in a comprehensive way.

I would be grateful if you could have this letter and its annex circulated as a document of the General Assembly under agenda item 119: follow-up to the outcome of the Millennium Summit of the sixty-second session of the United Nations General Assembly.

Please accept, Your Excellency, the assurances of my highest consideration.

(*Signed*) **Wang** Guangya
Ambassador and Permanent Representative
of the People's Republic of China to the United Nations

07-37685 (E) 250607 300707

Annex to the letter dated 5 June 2007 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

[Original: Chinese]

China's National Climate Change Programme

Prepared under the auspices of the National Development and Reform Commission, People's Republic of China
June 2007*

Contents

	Page
Foreword	3
Part 1 Climate change in China and efforts to address it	3
1.1 Observations and trends of climate change in China	4
1.2 Current GHG emissions in China	5
1.3 China's efforts and achievements in the mitigation of climate change	6
Part 2 Impact on China of climate change and the challenges it poses	10
2.1 China's basic national circumstances relating to climate change	10
2.2 Impact of climate change on China	12
2.3 Challenges facing China in dealing with climate change	14
Part 3 China's guidelines, principles and objectives for addressing climate change	16
3.1 Guidelines	16
3.2 Principles	17
3.3 Objectives	18
Part 4 China's policies and measures for addressing climate change	20
4.1 Key areas for GHG mitigation	21
4.2 Key areas for adaptation to climate change	32
4.3 Science and technology related to climate change	36
4.4 Public awareness regarding climate change	37
4.5 Institutions and mechanisms	38
Part 5 China's position on key climate change issues and the need for international cooperation	39
5.1 China's position on key climate change issues	39
5.2 Requirements for international cooperation on climate change	40

* In case of any discrepancy between the English translation and the Chinese original, the latter shall prevail.

Foreword

Climate change is a major global issue of common concern to the international community. While it involves both environment and development, climate change is ultimately an issue of development. As noted in the United Nations Framework Convention on Climate Change (hereinafter referred to as the UNFCCC), the largest share of historical and current global emissions of greenhouse gases has originated from developed countries, while per capita emissions in developing countries are still relatively low and the share of global emissions originating from developing countries will grow as they meet their social and development needs. The UNFCCC stipulates clearly that the Parties to the Convention "shall protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities", and "accordingly, the developed country Parties shall take the lead in combating climate change and the adverse effects thereof. It further provides that all Parties shall formulate, implement, publish and regularly update national programmes" to address climate change.

As a responsible developing country, China attaches great importance to the issue of climate change. It has established a National Coordination Committee on Climate Change, and instituted a series of policies and measures to address climate change in the overall context of its national sustainable development strategy, in order positively to contribute to the mitigation of and adaptation to climate change. As mandated under the UNFCCC, the Government of China hereby formulates China's National Climate Change Programme (hereinafter referred to as the CNCCP), outlining objectives, basic principles, and key areas of action, as well as policies and measures to address climate change for the period up to 2010. Guided by the scientific concept of development, China will sincerely carry out all the mandates in the CNCCP, strive to build a resource-conserving and environment-friendly society, enhance its national capacity to mitigate and adapt to climate change, and further contribute to the protection of the global climate system.

Article 4, Paragraph 7 of the UNFCCC provides that "the extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties". In this connection, while maintaining economic and social development, China will vigorously engage in effective and pragmatic cooperation with the international community as well as individual countries to implement this Programme.

Part 1
Climate change in China and efforts to address it

Many observations over the past 100 years indicate that the earth's climate is now undergoing significant change, characterized by global warming. The trend of climate change in China is generally consistent with that of global climate change. To address climate change and promote sustainable development, China has carried

out a variety of policies and measures, such as economic restructuring, energy-efficiency improvement, development and utilization of hydropower and other renewable energy, and ecological restoration and protection, as well family planning, which have contributed significantly to the mitigation of climate change.

1.1 Observations and trends of climate change in China

The Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) clearly indicated that most of the global warming observed over the past 50 years was likely induced by an increase in concentrations of greenhouse gases (GHGs), such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), owing to human activities. In the context of global warming, the climate in China has experienced noticeable changes over the past 100 years as well. The major evidence of climate change observed in China includes the following:

- *Temperature*. Annual average air temperature has increased by 0.5~0.8°C during the past 100 years, which was slightly greater than the average global temperature rise. Most of the temperature increase was observed over the last 50 years. In terms of regional distribution, the warming trend was more significant in western, eastern and northern China than south of the Yangtze River. In seasonal terms, the most significant temperature increase occurred in winter, and 20 consecutive warm winters were observed nationwide from 1986 to 2005.

- *Precipitation*. In the past 100 years, there has been no obvious change in annual precipitation in China, but considerable variation exists among regions. Annual precipitation has gradually decreased since the 1950s, at an average rate of 2.9 mm per decade, although it increased slightly from 1991 to 2000. In regional terms, the decrease in annual precipitation was significant in most of northern China, the eastern part of the northwest, and north-eastern China, averaging 20~40 mm per decade, with the decrease in northern China being most severe, while precipitation significantly increased in southern China and south-western China, averaging 20~60 mm per decade.

- *Extreme climate/weather events*. There have been noticeable changes in the frequency and intensity of extreme climate/weather events throughout China during the last 50 years. Drought in northern and north-eastern China and floods in the middle and lower reaches of the Yangtze River and south-eastern China have become more severe. Annual precipitation in most years since 1990 has been greater than normal; the dipolar pattern of precipitation leads to frequent disasters in the north and flooding in the south.

- *Sea level*. The rate of sea level rise along China's coasts during the past 50 years was 2.5 mm per year, slightly higher than the global average.

- *Glaciers*. The mountain glaciers in China have retreated, and the trend is accelerating.

The trend of climate warming in China will continue to intensify in the future. Projections by Chinese scientists indicate that:

- Nationwide annual mean air temperature will increase by 1.3~2.1°C over 2000 levels by 2020 and 2.3~3.3°C by 2050. The magnitude of warming will

increase in China from south to north, particularly in the north-western and north-eastern regions, where significant temperature rise is projected. It is estimated that by 2030, the annual temperature will likely increase by 1.9~2.3°C in north-western China, 1.6~2.0°C in south-western China, and 2.2~2.6°C in the Qinghai-Tibetan Plateau;

- Precipitation in China will possibly increase during the next 50 years, with a projected nationwide increase of 2~3 per cent by 2020 and 5~7 per cent by 2050. The most significant increase could be experienced in south-eastern coastal regions;

- The possibility of more frequent occurrences of extreme weather/climate events in China will increase, which will have immense impact on socio-economic development and people's livelihoods;

- Arid areas in China will probably become larger and the risk of desertification could increase;

- Sea levels along China's coasts will continue to rise; and

- The glaciers in the Qinghai-Tibetan Plateau and the Tianshan Mountains will retreat at an accelerated rate, and some smaller glaciers will disappear.

1.2 Current GHG emissions in China

According to the Initial National Communication on Climate Change of the People's Republic of China, China's total GHG emissions in 1994 were 4,060 million tons of CO_2 equivalent (3,650 million tons of net emissions), of which 3,070 million tons were of CO_2, 730 million tons were of CO_2 equivalent (CO_2e) of CH_4 and 260 million tons were of CO_2e of N_2O. According to tentative estimates by Chinese experts, China's total GHG emissions in 2004 were about 6,100 tons of CO_2e (5,600 million tons of net emissions), of which 5,050 million tons were of CO_2, 720 million tons were of CO_2e of CH_4 and 330 million tons were of CO_2e of N_2O. From 1994 to 2004, the annual average growth rate of GHG emissions was around 4 per cent, and the share of CO_2 in total GHG emissions increased from 76 per cent to 83 per cent.

Historically, China's GHG emissions have been very low, with per capita emissions below the world average. According to a study carried out by the World Resource Institute (WRI), China's CO_2 emissions from fossil fuel combustion were 79 million tons in 1950, accounting for only 1.13 per cent of the world total at that time; cumulative emissions of CO_2 from fossil-fuel combustion accounted for only 9.33 per cent of the world total during the period of 1950 to 2002, and the cumulative CO_2 emissions per capita were 61.7 tons over the same period, ranking 92nd in the world. Statistics from the International Energy Agency (IEA) indicate that per capita CO_2 emissions from fossil-fuel combustion in China were 3.65 tons in 2004, equivalent to only 87 per cent of the world average and 33 per cent of the level in Organization for Economic Cooperation and Development (OECD) countries.

While social and economic development were steadily advancing, the emission intensity (defined as the CO_2 emission per unit of GDP) generally declined. According to the IEA, China's emission intensity fell to 2.76 kilograms of CO_2 per

US$ (in constant year-2000 U.S. dollars) in 2004, as compared to 5.47 kilograms of CO_2 per US$ in 1990, a 49.5 per cent decrease. For the same period, the average world emission intensity dropped by only 12.6 per cent and those of the OECD countries dropped by 16.1 per cent.

1.3 China's efforts and achievements in the mitigation of climate change

As a responsible developing country, China was among the first to formulate a national Agenda 21 document, entitled China's Agenda 21 — White Paper on China's Population, Environment and Development in the 21st Century, soon after the United Nations Conference on Environment and Development in 1992. It also adopted a series of policies and measures, taking into account its specific national circumstances, to make positive contributions to the mitigation of climate change.

1.3.1 Restructuring the economy, promoting technological advancement and improving energy efficiency

Beginning in the late 1980s, the Government of China paid increasing attention to changes in patterns of economic growth and to restructuring the economy, and integrated the reduction of the consumption of energy and other resources, the promotion of clean production, and the prevention and control of industrial pollution into its national industrial policies. China's industrial structure has been significantly improved through the implementation of a series of industrial policies to accelerate the development of tertiary industries and restructure secondary industries. The respective GDP shares of primary, secondary and tertiary industries in 1990 was 26.9 : 41.3 : 31.8, while in 2005 it was 12.6 : 47.5 : 39.9. The share of primary industry underwent continuous decline, while that of tertiary industry grew greatly, especially in sectors such as telecommunication, tourism and finance. The overall share of secondary industry grew slightly, but its internal composition changed significantly; the proportion of high value-added products has increased owing to rapid development in the machinery, information technology and electronics sectors. Such change has brought about significant energy conservation benefits. During the period from 1991 to 2005, China achieved an annual GDP growth rate of 10.2 per cent, with an annual growth rate of 5.6 per cent in energy consumption, i.e. a factor of roughly 0.55 for elasticity of energy consumption.

As early as the 1980s, the Government of China adopted the principle of "equal treatment of development and conservation, with immediate emphasis on conservation", making energy conservation a matter of strategic importance in energy policy. Energy conservation was effectively promoted through the implementation of the Law on Energy Conservation of the People's Republic of China and related regulations, the development of specific energy-conservation plans, the adoption and implementation of technology, economic, fiscal and management policies in favour of energy conservation, the development and application of energy efficiency standards and labelling, the encouragement of research and development, the demonstration and dissemination of energy-saving technologies, the importing and absorption of advanced energy-saving technologies, the creation and employment of new energy conservation mechanisms, and the promotion of key energy-conservation projects. From 1990 to 2005, China's energy intensity (energy consumption per million yuan RMB GDP in constant year-2000

yuan RMB) decreased from 268 to 143 tons of coal equivalent (tce), dropping by an average annual rate of 4.1 per cent. The energy consumption per unit of energy-intensive products in the industrial sector declined strikingly. In 2004, as compared with 1990, for generators with capacity of 6MW and above, the unit energy consumption for thermal power supply decreased from 0.427kgce (kilograms of coal equivalent) per kilowatt-hour (kWh) to 0.376kgce/kWh; comparable energy consumption per ton of steel in key companies decreased from 997kgce to 702kgce; and comprehensive energy consumption per ton of cement in medium and large enterprises decreased from 201kgce to 157kgce. As calculated on a year by year comparison, during the period from 1991 to 2005, an accumulated 800 million tce of energy were saved by economic restructuring and energy-efficiency improvements, which is equivalent to a reduction of 1.8 billion tons of CO_2 emissions, using China's 1994 emission factor of 2.277 tons of CO_2 per tce.

1.3.2 Optimizing the energy mix by developing low-carbon and renewable energy

Under national policy guidance and with State financial support, the share of high-grade and clean energy has been increased by strengthening the development and utilization of hydropower, nuclear energy, oil, gas and coal-bed methane, and by supporting the development and utilization of new and renewable energy sources including biomass, solar, geothermal and wind power in rural, remote and other suitable areas. The share of coal in China's primary energy mix decreased from 76.2 per cent in 1990 to 68.9 per cent in 2005, whereas the shares of oil, gas and hydropower increased from 16.6 per cent, 2.1 per cent and 5.1 per cent in 1990 to 21.0 per cent, 2.9 per cent and 7.2 per cent in 2005 respectively.

By the end of 2005, installed hydropower generation capacity reached 117 gigawatts (GW) in China, accounting for 23 per cent of total power generation capacity, and the corresponding power generation was 401 terawatt-hours (TWh), accounting for 16.2 per cent of total electricity generation. There were more than 17 million household biogas digesters generating 6,500 million cubic metres of biogas annually; over 1,500 large- and medium-scale biogas digester construction projects have been completed, generating around 1,500 million cubic metres of biogas each year. The installed capacity of biomass generation was about 2 GW, of which sugar-cane-fired power capacity was about 1.7 GW and landfill-powered was about 0.2 GW. Production capacity of ethanol fuel derived from crops was 1.02 million tons. More than 60 wind farms have been built and connected to the power grid, with an installed capacity of 1.26 GW, and there were also about 200,000 small-scale wind power generators, with capacity of 40 MW, operating independently in remote areas. The total capacity of photovoltaic generation was around 70 MW, mainly operating as residential power supplies in remote areas. The heat-collecting area of existing solar heaters reached 85 million square metres. In 2005, the utilization of renewable energy in China (including large hydropower) equalled 166 million tce, accounting for 7.5 per cent of China's total energy consumption in that year, and equivalent to a savings of 380 million tons of CO_2 emissions.

1.3.3 Launching nationwide tree-planting and afforestation campaigns and enhancing the restoration and protection of the ecology

Since the initiation of its policy of reform and opening up to the outside world, China has made tremendous achievements in tree-planting and afforestation and has

implemented a series of key projects in forest ecology. According to the Sixth National Forest Survey, the acreage of conserved artificial forest in China was 54 million hectares, ranking highest in the world, and the amount of growing stock was 1,505 million cubic metres. Total area of forest cover in China was 174.91 million hectares, and the overall percentage of forest coverage increased from 13.92 per cent to 18.21 per cent from the early 1990s to 2005. In addition to tree-planting and afforestation, China has initiated many other policies for ecology restoration and protection, including natural-forest protection, reclaiming cultivated land for forest or grassland, pasture restoration and protection, and further enhancement of the greenhouse gas-sink capacity of forests. Meanwhile, urban green areas grew rapidly in China as well. By the end of 2005, the total green area in the built-up urban areas throughout the country reached 1.06 million hectares, with 33 per cent green coverage and 8.1 square metres of public green area per capita. The green area helps absorb CO_2 in the atmosphere. Experts estimate that a total of 3.06 billion tons of CO_2 were absorbed as a result of afforestation from 1980 to 2005, a total of 1.62 million tons of CO_2 as a result of forest management, and 430 million tons of CO_2 were saved as a result of reductions in deforestation.

1.3.4 Effectively controlling the population growth rate through family planning

The Government of China has designated comprehensive family planning a basic national policy, and the trend of excessive population growth has been brought under effective control. According to United Nations statistics, China's fertility rate is lower than that of other developing countries, and lower than the world average as well. In 2005, the birth rate in China was 12.40 per thousand and the natural growth rate was 5.89 per thousand, dropping by 8.66 and 8.50 per thousand respectively compared to 1990 and giving China one of the lowest fertility rates in the world. As a country with an underdeveloped economy, China has accomplished a historic transition in its pattern of population reproduction, from one featuring a high birth rate, low death rate and high growth rate to one featuring a low birth rate, low death rate and low growth rate in a relatively short period of time. Similar changes took decades or even up to a century for developed countries to realize in the past. From the initiation of the family planning programme up to 2005, over 300 million births had been averted nationwide. According to the average per capita emissions based on IEA statistics, these averted births have resulted in an annual reduction of CO_2 emissions by about 1.3 billion tons in 2005. This is a significant contribution that China has made in the fields of controlling world population and mitigating GHG emissions.

1.3.5 Strengthening laws, regulations, policies and measures related to addressing climate change

To address issues emerging in recent years, the Government of China has advocated a scientific concept of development and a major strategy for building a harmonious society, accelerating the construction of a resource-conserving and environment-friendly society and further reinforcing policies and measures related to addressing climate change. In 2004, the draft Medium and Long Term Energy Development Plan Outline for China 2004-2020 was approved by the State Council. In the same year, the first medium- and long-term energy conservation plan for China was launched by the National Development and Reform Commission (NDRC). In February 2005, the National People's Congress adopted the Renewable

Energy Law of the People's Republic of China, setting out the duties and obligations of the Government, enterprises and users in the development and utilization of renewable energy, as well as a series of policies and measures including total volume targets, mandatory grid connection, price management regulations, differentiated pricing, special funding, and favourable taxation. In August 2005, the State Council issued the Notification on Immediate Priorities for Building a Conservation-oriented Society, along with Several Opinions on Accelerating the Development of the Recycling Economy. In December 2005, the State Council issued the Decision to Publish and Implement the Interim Provisions on Promoting Industrial Restructuring, and along with the Decision to Strengthen Environmental Protection by Applying the Scientific Concept of Development. In August 2006, the State Council issued the Decision to Strengthen Energy Conservation. All these documents serve as the legislative and policy basis for further enhancing China's capability to address climate change.

1.3.6 Further improving institutions and mechanisms

China has established a National Coordination Committee on Climate Change (NCCCC), which presently comprises 17 ministries and agencies. The NCCCC has done a great deal of work to formulate and coordinate China's important climate change-related policies and measures, providing guidance for central and local governments' response to climate change. In 2001, in order conscientiously to fulfil China's commitment under the UNFCCC, the NCCCC began to organize work on the compilation of the Initial National Communication on Climate Change of the People's Republic of China, and presented the report to the UNFCCC at the tenth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 10) in December 2004. In recent years, the Government of China has enhanced its comprehensive climate change-related energy management by establishing a National Energy Leading Group and its administrative office. In October 2005, the amended Measures for Operation and Management of Clean Development Mechanism Projects was promulgated by the relevant departments of the Government.

1.3.7 Attaching great importance to climate-change research and capacity-building

The Government of China highly values and constantly enhances its capability and capacity to support scientific studies and research on climate change. It has implemented a number of key research projects, such as studies on global climate-change forecasting, impact and countermeasures, and environmental policies relating to global climate change. Projects such as studies of theories on the formation and prediction of key climate and weather disasters in China, and on the carbon cycle and its driving mechanism in China's terrestrial ecosystems, have been conducted under the National Programme for Key Basic Research Projects (the "National Climbing Programme"). A study of the carbon balance in China's land and offshore areas has been completed under the Innovative Research Programme. Other key projects related to climate change, such as studies of trends in and effects on China of changes in climate and sea level have also been conducted, and China's National Assessment Report on Climate Change has been completed. This study and research provide a scientific basis for developing national policies to address climate change and for China's participation in negotiations under the UNFCCC.

Several projects on international cooperation in Clean Development Mechanism capacity-building have also been conducted by relevant bodies in China.

1.3.8 Strengthening education, training and public awareness with regard to climate change

The Government of China always attaches importance to education, training and public awareness with regard to climate change. The Programme of Action for Sustainable Development in China in the Early 21st Century states that China will vigorously develop all forms of education at all levels to enhance public awareness regarding sustainable development, and to enhance scientific and cultural capacity for participation in sustainable development by reinforcing personnel training. In recent years, China has intensified its efforts to promote education, training and public awareness with regard to climate change by organizing lectures on basic climate change knowledge, conducting climate change training courses for policymakers at central and provincial levels, and organizing conferences on such topics as climate change and the ecological environment, as well as setting up an official bilingual website on climate change (China Climate Change Info-Net http://www.ccchina.gov.cn) in Chinese and English to provide comprehensive information on climate change. Commendable outcomes have been achieved as a result.

Part 2
Impact on China of climate change and the challenges it poses

Owing to limitations in knowledge and methods of analysis, there exist large uncertainties in current assessments of the impact of climate change that have been carried out by various countries. Studies indicate that climate change has already had some impact on China, such as rising sea levels in the coastal areas, glacial retreat in the northwest, and earlier arrival of the spring phenophase. Climate change will also significantly affect China's natural ecosystems and social economic system in the future. Meanwhile, as a country at a low stage of development, with a huge population, a coal-dominated energy mix and relatively low capacity to tackle climate change, China will surely face more severe challenges when coping with a changing climate at the same time as accelerating urbanization and industrialization and increasing residential energy consumption.

2.1 China's basic national circumstances relating to climate change

2.1.1 Unfavourable climatic conditions and severe natural disasters

China has relatively harsh climatic conditions. Most of China has a continental monsoon climate with seasonal temperature variations more drastic than those of other areas at the same latitude, such as North America and Western Europe. In most parts of China, it is cold in winter and hot in summer, with extremely high temperatures occurring in summer. Consequently, more energy is necessary to maintain a relatively comfortable room temperature. Precipitation in China is unevenly distributed both seasonally and spatially. Most precipitation occurs in

summer, and varies greatly among regions. Annual precipitation gradually declines in quantity from the south-eastern coastal areas to the north-western inland areas. China frequently suffers from meteorological disasters which are unusually severe in terms of the extent of the areas and population affected, as well as the variety and gravity of the disasters, as compared with those occurring elsewhere in the world.

2.1.2 Vulnerable ecosystem

The ecosystem of China is vulnerable. The national forest area in 2005 was 175 million hectares, covering just 18.21 per cent of its land area. In the same year, the area of China's grassland was 400 million hectares, most of which were cold high prairie and desert steppe; the grasslands in temperate areas of northern China are on the verge of degradation and desertification because of drought and environmental deterioration. China's total area of desertification for 2005 was 2.63 million square kilometres, accounting for 27.4 per cent of the country's territory. China's continental coastline extends over 18,000 kilometres, with an adjacent sea area of 4.73 million square kilometres, as well as more than 6,500 islands greater than 500 square metres in size. For this reason, China is vulnerable to rising sea levels.

2.1.3 Coal-dominated energy mix

China's primary energy mix is dominated by coal. In 2005, the primary energy production in China was 2,061 million tce, of which raw coal accounted for as much as 76.4 per cent. For the same year, China's total primary energy consumption was 2,233 million tce, of which the share of coal was 68.9 per cent, that of oil 21 per cent, and those of natural gas, hydropower, nuclear power, wind power and solar energy combined were 10.1 per cent; by comparison the shares of primary coal, oil, and natural gas, hydropower and nuclear-power energy consumption worldwide were 27.8, 36.4 and 35.8 per cent respectively. Because of its coal-dominated energy mix, the CO_2 emission intensity of China's energy consumption is relatively high.

2.1.4 Huge population

China has the largest population in the world. In 2005, the population of China's mainland was 1.31 billion (not including Hong Kong, Macao and Taiwan), accounting for 20.4 per cent of the world total. China still has a low level of urbanization, with a huge rural population of about 750 million, and in 2005, the urban population accounted for only 43 per cent of the national total population, lower than the world average. This massive population results in enormous pressure on employment, however; each year, more than 10 million new workers are added to the labour force in urban areas, and about 10 million rural workers also move to urban areas as a result of the urbanization process. Because of its huge population, China's per capita energy consumption is still low; in 2005, China's per capita commercial energy consumption was about 1.7 tce, only two-thirds of the world average, and far below that of the developed countries.

2.1.5 Relatively low level of economic development

China is currently at a relatively low level of economic development. In 2005, the per capita gross domestic product (GDP) of China was about US$ 1,714 (all figures based on 2005 exchange rates), only about one quarter of the average level

worldwide. Moreover, there are remarkable disparities among different regions of China in economic development. In 2005, the per capita GDP of the eastern areas of China was US$ 2,877, while that of the western areas was US$ 1,136, only 39.5 per cent of the former. Income disparities between rural and urban residents are also great; in 2005, the per capita disposable income of urban residents was US$ 1,281, while that of rural residents was only US$ 397, or 31.0 per cent of the former. Poverty eradication is still a huge challenge for China. As of the end of 2005, there were 23.65 million people in poverty in China's rural areas, with a net annual per capita income of less than 683 yuan RMB.

2.2 Impact of climate change on China

2.2.1 Impact on agriculture and the livestock industry

Climate change has already affected agriculture and the livestock industry in China to a certain extent, as primarily reflected in the advancement of the spring phenophase by 2 to 4 days since the 1980s. Future climate change could affect agriculture and the livestock industry by increasing instability in agricultural production, where the yields of the three main crops, i.e. wheat, rice and maize, are likely to decline if no appropriate adaptation measures are taken; by changing the distribution and structure of agricultural production as well as in cropping systems and crop varieties; by changing conditions of agricultural production, possibly leading to drastic increases in production costs and requirements for investment; by increasing the potential for aggravation of desertification, shrinking grassland areas and reducing productivity as a result of increased frequency and duration of droughts caused by climate warming; and by potentially increasing the rate of disease among domestic animals.

2.2.2 Impact on forest and other natural ecosystems

Climate change has affected forests and other natural ecosystems in China. Over the past 50 years, glaciated areas in north-western China decreased by 21 per cent and the permafrost on the Qinghai-Tibet Plateau lost up to 4-5 metres in thickness. Future climate change will continue to impact these ecosystems to some extent. For example, the geographical distribution of major forest types will shift northward and the vertical spectrum of mountain forest belts will move upward. The distribution range of major tree species for afforestation or reforestation, and of some rare tree species, is likely to shrink. Forest productivity and output will increase by varying degrees: by 1-2 per cent in tropical and subtropical forests, about 2 per cent in warm temperate forests, 5-6 per cent in temperate forests, and approximately 10 per cent in cold temperate forests. The frequency and intensity of forest fires and insect and disease outbreaks are likely to increase. Inland lakes and wetlands will dry up at an accelerated rate, and some glacier-dependent alpine and mountain lakes will eventually decrease in volume. The area of coastal wetlands will decrease, affecting the structure and function of coastal ecosystems. The area of glaciers and permafrost can be expected to decrease more rapidly; it is estimated that glaciers in western China will decrease by 27.7 per cent by the year 2050, and the spatial distribution pattern of permafrost on the Qinghai-Tibet Plateau will undergo significant alteration. Snow cover is projected to be greatly reduced, with significantly larger variation from year to year. Biodiversity will also be threatened;

the giant panda, Yunnan snub-nose monkey, Tibet antelope and Taiwania flousiana Gaussen (a species of conifer) are likely to be severely affected.

2.2.3 Impact on water resources

Climate change has already caused changes in the distribution of water resources throughout China. A decreasing trend in runoff has been observed over the past 40 years in six major rivers, namely the Haihe, Huaihe, Yellow, Songhuajiang, Yangtze, and Pearl Rivers. Meanwhile, there is evidence of an increase in frequency of extreme hydrological events, such as droughts in the north and floods in the south. The Haihe-Luanhe River basin is the region most vulnerable to climate change, followed by the Huaihe and Yellow River basins. The arid continental river basins are particularly vulnerable to climate change. In the future, climate change will have a significant impact on water resources throughout China: in the next 50 to 100 years, the mean annual run-off is likely to decrease noticeably in some arid northern areas, such as the Ningxia Hui Autonomous Region and Gansu Province, while it seems to be increasing markedly in a few already water-abundant southern provinces, such as Hubei and Hunan, indicating an increased incidence of flood and drought events as a result of climate change. The situation of water scarcity is expected to continue in northern China, especially in the Ningxia Hui Autonomous Region and Gansu Province, where water resources per capita are likely to decrease further over the next 50 to 100 years. Provided that water resources are exploited and utilized in a sustainable manner, water supply and demand should be basically in balance for most provinces for 50 to 100 years into the future. However, the gap between water-resource supply and demand may widen in the Inner Mongolia Autonomous Region, the Xinjiang Autonomous Region, Gansu Province, and the Ningxia Hui Autonomous Region.

2.2.4 Impact on coastal zones

Climate change has affected the coastal environment and ecosystems of China to some extent, mainly reflected in the accelerating trend of rising sea levels along the Chinese coast over the past 50 years, resulting in coastal erosion and seawater intrusions, as well as mangrove and coral reef degradation. Future climate change will have even greater impact on sea levels and coastal ecosystems in China. Sea levels along the Chinese coast will continue to rise; typhoon and storm surge frequencies will increase, aggravating the hazards induced by coastal erosion; and some typical marine ecosystems, including coastal wetlands, mangroves and coral reefs, will suffer further damage.

2.2.5 Impacts on other sectors

Climate change may also increase the frequency and intensity of heat waves, increasing deaths and serious illnesses induced by extreme high temperature events. Climate change is likely to stimulate the emergence and spread of some diseases and to increase the magnitude and scope of illnesses like cardiovascular diseases, malaria, dengue fever, and heatstroke, endangering human health. Meanwhile, climate change is increasingly affecting China's medium- to large-sized projects, owing to the increase in extreme weather and climate events and related hazards. Similarly, climate change may greatly harm natural and human tourism resources, as well as tourism security in some areas. In addition, global warming will exacerbate

the trend of increasing electricity consumption for air conditioning and place greater pressure on electric power supplies.

2.3 Challenges facing China in dealing with climate change

2.3.1 Critical challenges for China's current development pattern

Natural resources are fundamental to the development of a national economy. The industrial structure and economic advantages of a country are determined to a considerable degree by the availability and mixture of its resources. China has a large population and a relatively low level of development; its economic development has long been constrained by the scarcity of resources per capita, and this will continue to be the case for a long time. The development histories and trends of various countries reveal clear and positive correlations among per capita CO_2 emissions, per capita commercial energy consumption and economic development levels. In other words, at current levels of technological development, attaining the development level of the industrialized countries means that per capita energy consumption and CO_2 emissions will inevitably soar. In the history of human development, there is no precedent for the attainment of a high per capita GDP with low per capita energy consumption. In its ongoing economic development, China will inevitably be confronted with growing energy consumption and CO_2 emissions. The issue of GHG mitigation will pose a challenge to China to create an innovative and sustainable development pattern.

2.3.2 Huge challenge to China's coal-dominated energy structure

China is one of the few countries whose energy mixes are dominated by coal. In 2005, 68.9 per cent of China's primary energy consumption was coal, while the world average was only 27.8 per cent. Compared with oil and natural gas, coal's carbon content per unit calorific value is 36 per cent and 61 per cent higher, respectively. China will face much greater difficulties than other countries in decreasing its carbon intensity per unit of energy for three main reasons: its energy mix adjustment is constrained to a certain extent by the mix of energy resources; improvement in its energy efficiency is subject to the availability of advanced technologies and financial resources, and its coal-dominated energy resources and consumption structure will not change substantially for a long time into the future.

2.3.3 Great challenge to China's independent innovation in energy technologies

One of the main reasons for China's low energy efficiency and high GHG emission intensity is the outdated technologies of energy production and utilization prevalent in China. On the one hand, there are relatively large gaps between China and the developed countries in terms of the technologies used for energy exploitation, supply and conversion, transmission and distribution, industrial production and other end uses; on the other hand, outdated processes and technologies are still used in a relatively high proportion of China's key industries. For example, the overall energy consumption per ton of steel in large-scale iron and steel enterprises is about 200 kgce lower than that in small enterprises, and the overall energy consumption per ton of synthetic ammonia in large or medium enterprises is about 300 kgce lower than in small enterprises. Owing to the lack of advanced technologies as well as the large proportion of outdated processes and

technologies, China's energy efficiency is about 10 per cent lower than that of the developed countries, and its per-unit energy consumption of energy-intensive products is about 40 per cent higher than that at the advanced international level. Science and technology are the ultimate resort for humankind to tackle climate change. As China is now undergoing large-scale infrastructure construction for energy, transportation and buildings, the intensive emissions associated with these technologies will persist for the next few decades if advanced and climate-friendly technologies cannot be made available soon. This poses severe challenges to China's efforts to address climate change and mitigate GHG emissions.

2.3.4 Challenges for the conservation and development of forests and other natural resources

To combat climate change, it is necessary for China, on the one hand, to strengthen forest and wetland conservation in order to enhance its capacity to adapt to climate change; and on the other hand, to strengthen forest and wetland restoration and afforestation in order to enhance its capacities for carbon sequestration. Forest resources in China are far below the levels needed for social and economic development. With the acceleration of industrialization and urbanization, the need for forest and wetland conservation is increasing. Aridification, desertification, soil erosion, and wetland degradation remain severe environmental problems. Lands available for afforestation/reforestation are mostly located in areas suffering from sandy or rocky desertification, which pose a great challenge to forestation and ecological restoration.

2.3.5 Long-term challenges for adaptation to climate change in China's agricultural sector

China not only encounters frequent agricultural weather disasters that cause chronic instability in agricultural production, but also has a low per capita proportion of cultivated land, a less-developed agricultural economy and a very limited capacity for adaptation. Some of the long-term challenges for China's agricultural sector in terms of improving its capacity to adapt to climate change and cope with climatic disasters include finding ways to rationally adjust agricultural production distribution and structure, improve agricultural production conditions, control the incidence of plant diseases, pests/insects and the spread of weeds, reduce production costs, prevent potential desertification expansion, and ensure sustainable development of agricultural production.

2.3.6 New challenges for China's water resources development and conservation in adapting to climate change

There are two objectives for the development and conservation of water resources in adapting to climate change in China: promoting sustainable development and utilization of water resources, and enhancing the adaptive capacity of water resource systems to reduce their vulnerability to climate change. Some of the long-term challenges for water-resources development and conservation in terms of enhancing climate-change adaptation capabilities include finding ways to enhance water-resources management; optimize water-resources allocation; strengthen infrastructure construction; ensure flood prevention for large rivers, key cities and regions; promote a nationwide water-conservation programme; guarantee

safe drinking water and sound social and economic development; and make good use of river functions while protecting aquatic ecosystems.

2.3.7 Challenges for China's coastal regions in adapting to climate change

The coastal regions in China are densely populated and economically the most active in the country. Since most of these areas are low and flat, they are vulnerable to marine disasters caused by rising sea levels. At present, China clearly lacks capacity in marine environment monitoring, resulting in insufficient early warning and emergency-response capacity when dealing with ocean disasters associated with climate change. Lower standards for coastal tide-protection engineering also weaken its ability to deal with ocean disasters. In the future, coastal erosion, seawater intrusion, soil salinization and incursion of seawater into river estuaries caused by rising sea levels will be among real challenges in coping with climate change in China's coastal areas.

Part 3
China's guidelines, principles and objectives for addressing climate change

China's social and economic development is now at a stage of important strategic opportunity. China will implement its fundamental national policy of resource conservation and environmental protection to develop a recycling economy, protect the ecological environment and accelerate the construction of a resource-conserving and environment-friendly society. In order actively to fulfil its international commitments under the UFCCCC, China will strive to control its greenhouse gas emissions, enhance its capacity to adapt to climate change and promote harmonious economic development for the population, resources and the environment.

3.1 Guidelines

To address climate change and further contribute to protecting the global climate, China will adhere to the following guidelines:

- Comprehensively implementing the scientific concept of development;

  Promoting the construction of a harmonious socialist society;

- Advancing the fundamental national policy of resource conservation and environmental protection;

- Controlling GHG emissions and enhancing sustainable development capacity;

- Securing economic development;

- Conserving energy, optimizing the energy structure, and strengthening ecological preservation and construction;

- Relying on the advancement of science and technology; and

- Enhancing the capacity to address climate change.

3.2 Principles

To address climate change, China will be guided by the following principles:

– *Addressing climate change within the framework of sustainable development.* Not only is this a core common understanding arrived at by the international community, but addressing climate change is also the basic choice of all the parties to the Convention. As early as 1994, the Government of China formulated and published its sustainable development strategy, entitled China's Agenda 21 — A White Paper on Population, Environment and Development in the 21st Century. Later, in 1996, the Government of China, for the first time, adopted sustainable development as the key guideline and strategic goal for its national social and economic development. In 2003, the Government of China further formulated the Programme of Action for Sustainable Development in China in the Early 21st Century. China will continue to actively tackle climate change issues in accordance with its national sustainable development strategy in the future.

– *Following the principle of "common but differentiated responsibilities" of the UNFCCC.* According to this principle, developed countries should take the lead in reducing greenhouse gas emissions in addition to providing financial and technical support to developing countries. The primary and overriding priorities of developing countries are sustainable development and poverty eradication. The extent to which developing countries will effectively implement their commitments under the Convention will depend on the effective implementation by developed countries of their basic commitments.

– *Placing equal emphasis on both mitigation and adaptation.* Mitigation and adaptation are integral components of the strategy for coping with climate change. For developing countries, mitigation is a long and arduous challenge, while adaptation to climate change is a more present and immediate task. China will strengthen its policy guidance for energy conservation and energy structure optimization in an effort to control its greenhouse gas emissions. Meanwhile, China will take practical measures to enhance its capacity to adapt to climate change via key projects for ecosystem protection, disaster prevention and reduction and other key infrastructure construction.

– *Integrating climate change policy with other interrelated policies.* Since adaptation to climate change and mitigation of greenhouse gas emissions involve many social and economic factors, policies to address climate change and other related issues will only be effective if they are integrated. China will continue to consider energy conservation, energy structure optimization, ecological preservation and construction, and overall agricultural productivity advancement as important components of its national climate change policy. Therefore, China will give full consideration to climate change issues by integrating the policy of climate change mitigation and adaptation into its national social and economic development programme and pushing forward the policy in a coordinated way.

– *Relying on advancement and innovation in science and technology.* Technological advancement and innovation are the effective way to mitigate greenhouse gas emissions and enhance the capacity of adaptation to climate change. Aware of the leading and fundamental function of scientific and

technological advancement in mitigating and adapting to climate change. China will make great efforts to develop new and renewable energy technologies as well as new technologies of energy conservation, promote carbon-sink and other adaptive technologies, accelerate scientific and technological innovation and importation, and provide strong scientific support for addressing climate change and promoting sustainable development capacity.

– *Actively and extensively participating in international cooperation.* Global climate change is a serious common challenge for the international community. Though countries differ in their understanding of climate change and in ways and means of dealing with it, they share a basic consensus for cooperation and dialogue to jointly address the challenges it presents. China will continue actively to participate in the international negotiations on the UNFCCC and relevant activities of the IPCC. China is ready to strengthen international cooperation in addressing climate change, including cooperation on clean development mechanisms and technology transfers, and to join with the international community to tackle global climate change.

3.3 Objectives

The strategic goals of China in responding to climate change are to make significant achievements in controlling its greenhouse gas emissions, enhance its capability to continuously adapt to climate change, promote climate change-related science, technology and research and development to new levels, markedly raise public awareness regarding climate change, and further strengthen the institutions and mechanisms involved with climate change. In accordance with this strategic goal, China will make great efforts to achieve the following specific objectives by 2010:

3.3.1 Controlling greenhouse gas emissions

– Measures in this regard include accelerating the transformation of economic growth patterns; strengthening policy guidance on the conservation and efficient utilization of energy; reinforcing Governmental supervision and administration regarding energy conservation; expediting research and development, demonstration and deployment of energy-conservation technologies; bringing new market-based mechanisms for energy conservation into full play; raising public and social awareness regarding energy conservation; and accelerating the development of a resource-conserving society. These measures will enable China to achieve the target reduction of about 20 per cent in energy consumption per unit GDP by 2010, and consequently reduce CO_2 emissions.

– Measures to optimize the structure of energy consumption include vigorously developing renewable energy; actively promoting nuclear power plant construction; and speeding up the utilization of coal-bed methane. The target is to raise the proportion of renewable energy (including large-scale hydropower) in the primary energy supply to 10 per cent and the extraction of coal-bed methane to 10 billion cubic metres by 2010.

- Reinforcing industrial policy governing metallurgy, building materials, and the chemical industry; developing a recycling economy; raising resource utilization efficiency, and strengthening control of nitrous oxide emissions. By 2010, emissions of nitrous oxide from industrial processes will stabilize at 2005 levels.

- Promoting the adoption of low-emission and high-yield rice varieties, semi-dry rice cultivation techniques, and scientific irrigation technology; strengthening research on and development of superior ruminant animal breeds and large-scale breeding and management techniques; reinforcing the management of animal wastes, wastewater and solid wastes; and promoting biogas utilization to control the growth rate of methane emissions.

- Increasing the forest coverage rate to 20 per cent and realizing a carbon sink increase of 50 million tons over 2005 levels by 2010. Measures in this regard include continuous implementation of afforestation policies and measures, returning farmland to forest and grassland, protecting natural forests, and carrying out basic farmland and other key engineering construction.

3.3.2 Enhancing capacity to adapt to climate change

- Through strengthening farmland infrastructure, adjusting cropping systems, selecting and breeding stress-resistant crop varieties and developing biotechnologies and other adaptive countermeasures, the 2010 targets are to increase improved grassland by 24 million hectares, restore 52 million hectares of grassland suffering from degradation, desertification, and salinity, and striving to increase the efficient utilization coefficient of agricultural irrigation water to 0.5.

- Establishing key ecological protection areas and enhancing natural ecological restoration through strengthening natural forest conservation and nature reserve management and continuously implementing key ecological restoration programmes. By 2010, 90 per cent of typical forest ecosystems and key national wildlife are to be effectively protected, nature reserve areas are to account for 16 per cent of China's total territory, and 22 million hectares of desertified lands are to be brought under control.

- By 2010, the vulnerability of water resources to climate change should be reduced by effective measures, such as rationally exploiting and optimizing allocation of water resources, creating new mechanisms for infrastructure construction, and popularizing water conservation. At that time, flood-prevention engineering systems in large rivers and a high standard for farmland drought relief will be completed.

- By 2010, construction and expansion of mangroves will be completed, the capability to deal with marine disasters will be raised markedly, and the social influence and economic losses caused by rising sea levels will be reduced to the greatest extent possible by scientifically monitoring sea level change and regulating marine and coastal-zone ecosystems, by rational exploitation of coastlines and coastal wetlands, and by construction of a coastal shelterbelt system.

3.3.3 Enhancing research and development

- China will work hard to attain international levels of advanced research on climate change in some fields by 2010, so as to provide an effective and scientific basis for the development of national strategies and policies on climate change, as well as scientific guidance for participating in international cooperation on climate change. Measures in this regard include strengthening basic research on climate change, further developing and improving research and analytical methodology, intensifying training and capacity-building for professionals and decision makers dealing with climate change.

- In order to build strong scientific support for addressing climate change, China will work hard to develop its independent innovation capacity, promote international cooperation and technology transfer, achieve breakthroughs in research on and development of energy development, energy conservation and clean energy technology, and significantly enhance the adaptation capacity of agriculture and forestry by 2010.

3.3.4 Raising public awareness and improving management

- By means of modern information-dissemination technologies, China will strengthen communication, education and training in order to raise public awareness and participation with regard to climate change. China will work hard to transfer knowledge of climate change to all residential communities by 2010, raise the awareness of society as a whole, and create a social environment conducive to addressing climate change.

- Other measures include further improving inter-ministerial decision-making and coordination mechanisms on climate change, and establishing an action mechanism for response to climate change involving a wide range of enterprise and public participation. By 2010, China will establish a suitable and highly efficient institutional and management framework to address climate change in the future.

Part 4
China's policies and measures for addressing climate change

In accordance with the mandate to carry out the scientific concept of development, China will combine its efforts to address climate change with implementation of its sustainable development strategy, and with the hastening of the construction of a resource-conserving and environment-friendly society and an innovative country, which will be integrated into the overall national economic and social development plan and regional plans. China will also mitigate greenhouse gas emissions and improve its capacity to adapt to climate change. China will make its efforts to realize the objectives and tasks presented in this programme by adopting a series of institutional, legal, economic and technological instruments designed to strengthen energy conservation, optimize the energy mix, improve the ecological environment, enhance adaptation capacity, intensify research and development and improve research capacity, raise public awareness, and improve mechanisms for climate change administration.

4.1 Key areas for GHG mitigation

4.1.1 Energy production and transformation

(1) Formulating and implementing relevant laws and regulations

In order to vigorously strengthen energy legislation to establish and improve the energy legal system, promote the implementation of China's national energy-development strategy, establish the legal status of the medium- and long-term energy programme, promote the optimization of the energy mix, and mitigate GHG emissions from energy production and transformation, China will implement the following major policies and measures:

– *Expediting the drafting and amendment of laws and regulations favourable to GHG mitigation.* In accordance with its need for sustainable social and economic development in order to establish a stable, economic, clean and secure energy supply and service system, China will constitute ar omulgate a national energy law as early as possible, amend legislation governing the coal industry and electric power, and further intensify preferential policies to develop and utilize clean and low-carbon energy.

– *Strengthening research and formulating an energy strategy programme.* Preparing national medium- and long-term energy strategies, and preparing or improving the national energy programme and special programmes for coal, electricity, oil and natural gas, nuclear energy, renewable energy and oil reserves will improve China's capabilities in sustainable energy supply and clean energy development.

– *Comprehensively implementing legislation on renewable energy.* China will develop supportive regulations and policies, prepare national and local programmes for renewable energy development, identify development objectives, and integrate renewable energy development into assessment indicator systems for the construction of a resource-conserving and environment-friendly society. Through legislation and other approaches, domestic and international economic entities will be guided and encouraged to participate in renewable energy development and utilization, and clean energy development will be pursued.

(2) Strengthening institutional innovation and mechanism construction

– *Accelerating institutional reform in the energy sector.* China will hasten progress on the reform of energy management institutions; further optimize the energy mix by market mechanisms and government promotion; actively and carefully promote energy price reform and gradually formulate pricing mechanisms that can reflect resource scarcity, market supply and demand, and pollution control costs; establish pricing systems that help adjust the energy mix and sustainable development; and deepen institutional reform of foreign trade by controlling the export of energy-intensive, pollution-intensive and resource-intensive products, so as to formulate an import and export structure favourable to promoting a cleaner and more optimal energy mix.

– *Further promoting mechanism construction for renewable energy development.* Based on the principle of integrating Government guidance, policy support and market forces, stable mechanisms for investment will be established through

Government investments, concessions and other measures. A sustainable and stably expanding market for renewable energy will be fostered, the market environment for renewable energy will be improved and the obligation of national electricity grids and petroleum sales enterprises to purchase renewable energy products under the renewable energy law will be implemented.

(3) Intensifying relevant policies and measures in the energy industry

– *Appropriately developing hydropower on the precondition of protecting the ecosystem.* Hydropower development should be regarded as an important countermeasure for promoting a cleaner and less carbon-intensive energy mix in China. On the precondition of environmental protection and appropriate migrant relocation, China will develop and utilize its abundant hydropower resources and expedite the development of hydropower, with an emphasis on development in the western regions and on small-scale hydropower. It is expected that GHG emissions can be reduced by about 500 million tons of CO_2 by 2010 by means of these countermeasures.

– *Actively promoting the development of nuclear power.* Nuclear power should be regarded as an important component of national energy strategy, hence the proportion of nuclear power in China's national primary energy supply will increase gradually, and construction of nuclear power stations in coastal regions with faster economic development and heavier electricity loads should be expedited. China will also unify technological approaches and adopt advanced technology to realize independent domestic construction of large-scale nuclear power stations and improve the overall capacity of the nuclear power industry on the basis of principles of self-sufficiency, international cooperation, technology transfer and promoting independence. It is expected that GHG emissions can be reduced by about 50 million tons of CO_2 by 2010 by means of these countermeasures.

– *Expediting technology advancement in thermal power generation.* China will optimize the mix of thermal power generation through phasing out small-scale, outdated units; appropriately develop small-scale distributed natural gas or coal-bed methane electric power generation; develop 600 MW or greater supercritical (ultra-supercritical), large combined-cycle, and other highly efficient and clean power-generation technologies; develop heat and power cogeneration, cogeneration of heat, power and cooling, and combined heat-electricity-coal gas multiple supplies; and strengthen power-grid construction through adopting advanced power-transmission, -transformation and -distribution technologies as well as reducing losses occurring in power transmission, transformation and distribution. It is expected that GHG emissions can be reduced by about 110 million tons of CO_2 by 2010 by means of these countermeasures.

– *Vigorously developing the coal-bed methane (CBM) and coal-mine methane (CMM) industries.* Coal-bed methane exploration, development and utilization should be adopted as important tools to expedite the structural optimization of the coal industry, reduce accidents connected with coal production, improve rates of resource utilization and prevent environmental pollution; and minimize energy wastes and methane emissions in coal mining processes.

Major incentive policies include exempting or partially exempting surface extraction and exploration projects from user fees for prospecting and mining rights; adopting preferential tax policies for coal-bed methane exploration and utilization projects and other comprehensive CBM and CMM utilization projects; applying preferential policies (as defined in existing legislation governing renewable energy) to CBM and CMM power generation; maintaining prices for CBM and CMM for industrial and residential use at levels similar to those for natural gas with the same calorific value; and encouraging the cooperation of CDM (clean development mechanism) projects. It is expected that GHG emissions can be reduced by about 200 million tons of CO_2 equivalent by 2010 by means of these countermeasures.

– *Promoting the development of bioenergy*. China will vigorously promote biomass energy development and utilization by attaching significant importance to bioenergy based power generation and the development of marsh-gas, biomass-briquette and biomass-liquid fuels; construct or reconstruct straw-fired power plants and small- to medium-scale boilers in major crop production areas where biomass energy resources are abundant; construct garbage-burning power plants in areas with developed economies but scarce land resources; construct marsh-gas projects and install appropriate power generation facilities at large-scale livestock or bird farms and sewage-treatment plants for industrial wastewater and urban residential wastewater; vigorously promote marsh-gas and gasification technologies for agricultural and forestry wastes, aiming at increasing the percentage of gas in rural residential energy consumption and using biomass gasification technology as an important instrument to abate environmental problems caused by rural residential and industrial wastes; make efforts to develop solid-briquette and liquid biomass fuels, and put forward economic policies and preferential measures in favour of bioethanol and other biomass fuels to promote significant biomass energy development and utilization. It is expected that GHG emissions can be reduced by about 30 million tons of CO_2 equivalent by 2010 by means of these countermeasures.

– *Actively supporting the development and utilization of wind, solar, geothermal and tidal energy*. Through the development and construction of large-scale wind-power farms, China will promote technological improvement and industrial development for wind power, and achieve domestic manufacturing of wind-power equipment to reduce costs and improve the market competitiveness of wind power as early as possible. It will also actively develop solar power and solar heating, including popularizing family-use photovoltaic power systems or small-scale photovoltaic power plants in remote areas; disseminate integrated solar energy buildings, solar energy-based hot water supplies and space heating and cooling pilot projects in urban areas, and popularize household solar water heaters, greenhouses and stoves in rural areas; actively promote the development and utilization of geothermal energy and tidal energy through popularizing geothermal space heating, hot water supply and geothermal heat-pump technologies that meet the requirements of environmental and water-resource protection; and develop tidal power generation technology in Zhejiang, Fujian, Guangdong and other provinces while conducting research on power generation based on wave energy and

other oceanic energy. It is expected that GHG emissions can be reduced by about 200 million tons of CO_2 by 2010 by means of these countermeasures.

(4) *Strengthening the development and dissemination of advanced and appropriate technologies*

China will vigorously improve its technological self-innovation capacity for the development and utilization of conventional, new and renewable energy, promote the sustainable development of energy industries, and improve the capacity to address climate change.

Technologies for the clean and efficient development and utilization of coal. China will emphasize research on and development of high-efficiency coal-mining technologies and supporting equipment, efficient power-generation technologies and equipment such as heavy-duty gas turbines, integrated gasification combined cycle (IGCC) and high-pressure, high-temperature ultra-supercritical units, and large-scale supercritical circulation fluid-bed boilers; and vigorously develop coal-liquefaction, -gasification and coal-chemistry and other technologies for coal conversion, coal gasification-based multi-generation systems technology, and carbon dioxide capture, utilization, and storage technologies.

Exploration, exploitation and utilization technologies of oil and gas resources. China will focus on technological development of oil and gas exploration in intricate fault-block and lithology strata, and high-efficiency technology for the development of low-grade oil and gas resources; improve oil-recovery ratio technology and deep oil and gas exploration and development technologies; and prioritize research on and development of deep-sea oil/gas pool-exploration technology and heavy-oil reservoirs to enhance integrated recovery ratio technology.

Nuclear power generation technology. China will research and master fast-reactor design and its core technologies, including nuclear-fuel and structural material-related technology; make breakthroughs in sodium circulation and other key technologies; and actively participate in the construction of and research on international experimental thermonuclear fusion reactors.

Renewable energy technology. China will prioritize the development of low-cost and scaled exploitation and utilization technologies, including the development of large-scale wind-power generation equipment, high performance and low-cost photovoltaic battery technology, solar thermal-power generation, integrated solar energy-building technology, and biomass and geothermal energy development and utilization technologies.

Power transmission and distribution and grid-safety technologies. China will prioritize the research on and development of large-capacity long-distance DC transmission technology and super high-voltage transmission technology and equipment, grid transmission and distribution technology for intermittent power sources, electric-power quality monitoring and control technology, large-scale interconnected grid-security technology, key technologies in the "West-to-East" Power Transmission Project, grid-management automation technology, information technology, and efficient management of the power supply and distribution system.

4.1.2 Energy efficiency improvement and energy conservation

(1) Accelerating the drafting and implementation of related laws and regulations

– *Improving existing energy-saving regulations and standards.* China will amend and improve existing legislation governing energy conservation; establish a strict management system for energy conservation; further clarify the legal responsibilities of individual entities; intensify policy incentives; identify subjects of law enforcement; intensify disciplinary efforts; constitute necessary supporting regulations governing the management of electricity, petroleum and energy conservation in buildings; formulate and improve energy efficiency standards for primary energy-consuming industrial equipment, domestic appliances, lighting appliances and motor vehicles; amend and perfect energy-saving design criteria for primary energy-consuming industries and energy-saving standards for buildings; and accelerate the formulation of temperature control standards for building refrigeration and space heating.

– *Strengthening supervision and monitoring of energy conservation.* China will improve the process of compulsory retirement of energy-intensive and outdated processes, technologies and equipment; phase out outdated and energy-intensive production processes and equipment in accordance with the law; improve marketing of key energy-consuming products and new-type buildings; prohibit producing, importing or selling products that fail to meet basic energy-efficiency standards, and forbid the sale or use of buildings that fail to meet the energy-saving building-design standards; strengthen the supervision and monitoring of the energy utilization status of key energy consumer entities; strengthen supervision of the energy utilization status of energy-intensive industries, government office buildings and large-scale public buildings; and strengthen supervision of the implementation of energy efficiency standards for products, building energy-saving design standards and industry design criteria.

(2) Strengthening institutional innovation and mechanism-building

– *Establishing target-oriented responsibility and assessment systems for energy conservation.* China will implement a system to announce energy consumption per unit of GDP; improve systems to disseminate information on energy conservation; promptly publicize all types of energy consumption information through the use of modern information-dissemination technology; and guide local government and enterprises in strengthening energy conservation.

– *Carrying out comprehensive resource planning and electric power demand-side management.* China will integrate energy conservation figures as a resource category in overall planning so as to guide reasonable resource allocation; adopt effective measures to enhance electricity end-use efficiency; and optimize electricity use patterns to save electricity.

– *Actively promoting authentication of energy-saving products and implementing an energy-efficiency labelling management system.* China will apply market mechanisms to encourage and guide consumers to purchase energy-saving products.

– *Advocating contract-based energy management to overcome market barriers to promoting new energy-saving technologies, and promoting industrialization*

of energy-saving practices. China aims to facilitate the provision of comprehensive services, such as diagnosis, design, financing, renovation, operation and management, for enterprises implementing energy-saving renovations.

– *Establishing mechanisms for energy-saving investment assurance to promote the development of energy-saving technological service systems.*

– *Popularizing voluntary energy-saving agreements to create enthusiasm for energy conservation among enterprises and professional organizations.*

(3) Strengthen relevant policies and measures

– *Vigorously adjusting industrial structure and its regional distribution*. China will promote the development of the service industry and increase its share of the national economy; integrate energy conservation, environmental protection and control of greenhouse gas emissions into regional economic development; and determine the functions of different regions in order to promote diversified regional development patterns, in accordance with environmental and resource-carrying capacities and development potential, and in the light of the requirements for primary-function zones.

– *Strictly implementing the Catalogue for the Guidance of Industrial Structure Adjustment*. China will control the scale of energy-intensive and pollution-intensive industries and reduce their share of the national economy; encourage the development of new and high-tech industries; give priority to the development of the information industry so that it plays a leading role in economic growth with lower energy consumption; draft and implement development plans and industrial policies for steel, non-ferrous metals, cement and other energy-intensive industries; raise sectoral entrance thresholds; and develop and improve policies governing the export of domestically scarce resources and energy-intensive products.

– *Formulating preferential policies for energy-saving products*. China will focus on end-use equipment, including high-efficiency electric motors, fans, pumps, transformers, appliances, lighting products and energy-saving building products; implement incentive policies for the production and utilization of energy-saving products included in the Catalogue, and list energy-saving products in the Government procurement inventory; support key energy conservation projects and key energy-saving technology development and demonstration projects with investment and financial assistance or loan interest subsidies; and study and formulate economic incentive policies for the development of energy-saving and land-saving buildings and green buildings.

– *Studying financial and tax policies that encourage the development of energy-saving and environment-friendly vehicles, and hastening the elimination of fuel-inefficient vehicles*. China will implement a fuel-tax reform policy at an appropriate time; formulate industrial policies that encourage the development of energy-saving and environment-friendly vehicles with low emissions; develop consumer policy measures to encourage energy-saving and environment-friendly vehicles with low engine displacement, abolish various restrictions on energy-saving and environment-friendly vehicles with low displacement, and guide the public to embrace the idea of purchasing and

maintaining conservation-oriented automobiles; vigorously develop public transport systems and increase the proportion of rail transport in urban areas; and study policies to encourage the production and consumption of hybrid and electric vehicles.

(4) *Strengthening the development and dissemination of energy conservation technologies in key sectors*

- *Iron and steel industry*: Coke ovens should be equipped with dry-quenching facilities, and newly constructed blast furnaces should be equipped with furnace-top pressure differential power-generating equipment (TRT); advanced technologies and equipment, such as beneficiated material-feeding, rich oxygen coal spurt, molten iron pre-treatment, large-scale blast, converter, and super-power electric-arc furnaces, external furnace refining, continuous casting, continuous rolling, controlled casting and controlled cooling, should be applied throughout the industry.

- *Nonferrous metal industry*: Mines should be required to use primarily large, highly efficient and energy-saving equipment. Advanced oxygen-enriched flash and oxygen-enriched bath-smelting processes should be adopted in copper smelting; large pre-baking electrolytic cells should be adopted in electrolytic aluminium smelting; the new oxygen bottom-blowing process and other technologies of direct-oxygen lead smelting should be adopted in lead smelting; and a new wet process should be developed for zinc smelting.

- *Oil and petrochemical industry*: Systematic optimization technology for oil exploitation, energy-saving supplementary technology for thick hot-oil exploitation, optimized operation technology for water-filling systems, comprehensive energy-saving technology for enclosed oil and gas collection and transmission, and recovery and reutilization technology for discharged natural gas should be applied in oil and natural-gas exploitation. In the process of ethylene production, the raw material structure should be optimized and ethylene cracking furnaces should be retrofitted with advanced technology. Large-scale synthetic ammonia plants should deploy advanced energy-saving technical processes, new catalysts and high-efficiency energy-saving equipment, promote technology for recovering residual heat from flue gas in single-section furnaces for gas-based ammonia synthesis, and accelerate retrofitting to replace fuel oil with clean coal or natural gas for oil-based ammonia synthesis. Energy-saving equipment and variable-pressure absorption-recovery technology should be applied to medium- and small-scale ammonia synthesis, and coal/water slurry or advanced pulverized-coal gasification technology should replace traditional fixed-bed coal gasification technology. In the production of caustic soda, the graphite-anode diaphragm process should be gradually eliminated, and the use of the ion membrane method should be increased.

- *Building materials industry*: New dry-process kilns with pre-calcinator technology should be developed in the cement industry; energy-efficient grinding equipment and power-generating technology should be promoted through the use of waste heat recovered from cement kilns; the performance of existing large- and medium-size rotary kilns, mills and drying machines should be improved with a view to energy conservation; and mechanized vertical

kilns, wet-process kilns and long dry-process kilns and other outdated cement-production technologies should be gradually phased out. In the glass industry, an advanced float process will be developed; the outdated Fourcault and Colburn processes will be eliminated; and technologies of overall furnace and kiln heat insulation and enriched-oxygen and full-oxygen combustion will be promoted. In the architectural ceramics industry, outdated down-draft kilns should be discarded, and slab, multi-hole and roller kiln technology should be promoted. In sanitary ceramics, the composition of fuel will be changed and clean gas fuel used in order to apply saggar-free firing technology. Further targets for promotion should include the application of new wall materials and thermal insulation as well as high-quality, environment-friendly and efficient sound-insulation, waterproofing and sealing materials; and the proportion of high-performance concrete applications should be increased and the lifespan of buildings extended.

– *Transportation*: China will speed up both the elimination of old energy-intensive automobiles and the development of diesel automobiles, heavy-duty and special vehicles; popularize vans and special transport vehicles such as container vehicles; promote the implementation of a national standard for vehicle fuel consumption limits to constrain the development of low fuel-economy vehicles; accelerate the development of electrified railways; develop high-efficiency AC-DC-AC electric locomotives; promote pulling-power factor compensation technology and other power-saving measures for electrified railways, to improve the efficiency of electric-power utilization; develop locomotive-powered passenger-carriage technology; promote powered passenger carriages in order to gradually reduce and eliminate diesel-fuelled locomotives; adopt energy-saving aircraft designs; improve shipping and passenger-occupancy rates, transportation turnover capability and fuel-oil efficiency, and reduce oil consumption; and accelerate the elimination of old ships by formulating technical standards for ships and introducing new types of ships and advanced power systems.

– *Agricultural machinery*: China will phase out outdated agricultural machinery; apply advanced energy-saving diesel-engine technology so as to reduce diesel-engine fuel consumption; promote advanced mechanized farming technology such as non-tillage and combination processes; adopt more electric motors in fixed production sites; apply renewable energy such as hydro, wind and solar energy to agricultural machinery; improve utilization efficiency and reduce fishery oil consumption by phasing out outdated fishing ships.

– *Building construction*: China will prioritize the development of green building-design technology, energy-saving building technology and equipment, integrated renewable-energy devices in buildings, high-quality and environment-friendly construction techniques and equipment, energy-saving and environment-friendly building materials and technical standards; and improve technologies and standards for existing buildings.

– *Commercial and residential energy conservation*: China will promote household and office electric appliances such as high-efficiency energy-saving refrigerators, air conditioners, televisions and washing machines; reduce stand-by energy consumption of appliances; implement energy-efficiency standards and labelling; standardize the marketing of energy-saving products; promote

high-efficiency fluorescent-lamp products such as energy-saving phosphorus lamps, high-intensity gas-discharge lamps, and electronic ballasts; decrease the use of incandescent lamps and gradually eliminate high-pressure mercury-vapour lamps; implement energy efficiency standards for lighting products; and increase the use of energy-saving high-efficiency fluorescent lamps.

(5) *Further carrying out the 10 key energy conservation priority programmes in the Medium- and Long-Term Energy Conservation Plan*

China will actively promote the implementation of 10 key energy-conservation programmes in the following areas: upgrading low-efficiency coal-fired industrial boilers (kilns), district heat and power cogeneration, residual heat and pressure recovery, oil conservation and substitution, motor-system energy conservation, energy-system optimization, energy conservation in buildings, environment-friendly lighting, energy conservation in government agencies, development of energy conservation monitoring, and technological support systems, and will ensure that the progress and results of these key programmes will realize stable capacity for energy conservation as early as possible. Through the implementation of these programmes, it is estimated that 240 million tce can be conserved during the 11th Five-year Plan period (2005-2010), equivalent to a reduction of 550 million tons of CO_2.

4.1.3 Industrial processes

- *Vigorously developing the recycling economy and following new patterns of industrialization.* In accordance with the principle of "reduction, reuse and recycling of waste" and the new industrialization requirements, China will take various effective actions and measures to further promote the development of clean production and the recycling economy in the industrial sector, so as to accelerate the construction of a resource-conserving and environment-friendly society. In order to reduce greenhouse gas emissions from the production and use of industrial products, China will work hard to conserve the use of cement, lime, iron and steel, calcium carbide and other raw materials to the utmost while satisfying the demand for these industrial products as necessary for legitimate social and economic development.

- *Encouraging the conservation of iron and steel, and restricting the export of steel products.* For this purpose, China will further carry out its development policy for the iron and steel industry and encourage the substitution of renewable materials for iron and steel as well as recycling of waste steel to reduce steel use; encourage the application of the short-flow process technique, using waste steel as raw material for steel production; organize the revision and improvement of standards for structural-steel design and utilization to reduce the use of steel consistent with safety requirements; encourage the research, development and deployment of new high-performance, low-cost and low-consumption materials as substitutes for steel; encourage iron and steel plants to produce high-strength and corrosion-resistant steel to enhance its strength and service life; restrict the export of ferro-alloy, pig iron, waste steel, steel billets and ingots, rolled steel and other steel products; and abolish the policy of export tax rebates, or at least lower the rebate rate, for the export of steel products.

– *Further promoting the production of bulk and slag cement.* China will follow the guideline of discouraging the production of bagged cement and encouraging the development of bulk cement; further strengthen the policy of collecting special fees for the development of bulk cement on the sale and use of bagged cement from producers and users; continue to implement tax concessions and other preferential policies for slag cement and its products; and further promote the premixed-concrete and ready-mixed mortar processes, so as to maintain the rapid growth momentum of bulk cement.

– *Launching a vigorous building-materials conservation campaign.* Measures in this regard include further promoting the construction of buildings that conserve energy, water, materials and land; putting forward a new building system; promoting the application of high-performance, low-consumption, renewable and recoverable building materials; promoting the application of high-strength and high-performance concrete; promoting the recovery and utilization of construction rubbish and waste; making full use of straw to produce plant fibre board; fulfilling the regulations governing design, construction, material-use accounting and other requirements; and revising the relevant material consumption standard for engineering projects, to guide enterprises in putting forward material-saving technology.

– *Strengthening emission controls for nitrous oxide and other greenhouse gases.* Measures in this regard include further promoting the development of CDM projects and other kinds of international cooperation in the adipic acid production sector; actively seeking financial resources and technical assistance necessary for the controlling emissions of nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6); renovating off-gas recovery facilities in nitrous oxide production plants to update emission controls; and taking various other measures to reduce the emissions of these gases.

4.1.4 Agriculture

– *Strengthening the enactment and implementation of laws and regulations.* Measures in this regard include gradually establishing and improving the system of laws and administrative rules and regulations governing agriculture, grasslands and land management, with a view to attaining improved agricultural production and increased agricultural ecosystem carbon storage; developing farmland and pasturage protection plans; strictly controlling land reclamation in areas with fragile ecosystems, and forbidding wasteful land use or destruction of pasturage of any kind.

– *Intensifying the development of ecological agriculture in highly intensive production areas.* Measures in this regard include implementing projects on prevention and control of non-point source agricultural pollution; extending the application of technologies involving reasonable use of chemical fertilizers and pesticides to improve farmland quality; and implementing a new round of the Fertile Soil Programme, scientifically applying chemical fertilizers and guiding the increased use of organic fertilizer to promote soil fertility and reduce nitrous oxide emissions from croplands.

– *Further enhancing technology development and transfer.* Measures in this regard include selecting and breeding rice varieties with high yields and low

GHG emission rates; promoting semi-dry rice cultivation technology, scientific irrigation, and research on and development of micro-organism technology; reducing methane emissions from rice paddies; research on and development of technologies to breed superior ruminant varieties; improving management practices for intensive livestock operations and reducing methane emissions from livestock; further promoting straw treatment technology and enhancing/refining technologies for household-type biogas digesters; developing and transferring key technologies to produce environmentally sound fertilizers and reduce nitrous oxide emissions from croplands; and vigorously promoting the return of straw to croplands, along with other non-tillage technologies, to increase cropland carbon sinks.

4.1.5 Forestry

- *Improving drafting and implementation of laws and regulations*: Measures in this regard include accelerating the formulation, amendment, and streamlining of forestry-related laws and regulations, including development of regulations on natural forest conservation, forest transfer rights, forest products, and forest land use; and enhancing the implementation of laws and regulations by means of systemic improvements, strengthened inspections, and expanded social supervision by law enforcement.

- *Reforming and optimizing current industrial policies*: Measures in this regard include optimizing the target-oriented management responsibility system for afforestation by governments at all levels and forestry sectors, and investigating methods of voluntary national tree-planting under the market economy and establishing related policies to promote voluntary planting and governmental afforestation, so as to increase forest resources and carbon sequestration.

- *Strengthening key ecological forestry programmes*: Measures in this regard include continuously implementing key forestry programmes, such as the Natural Forest Protection Programme (NFPP), the Conversion of Cropland to Forest Programme (CCFP), the Sandification Control Programme for areas in the vicinity of Beijing and Tianjin, the Key Shelterbelt Development Programme in parts of the Yangtze River, and the Wildlife Conservation and Nature Reserve Development Programme, so as to protect existing forest carbon stock and enhance carbon sequestration.

4.1.6 Municipal wastes

- *Strengthening the implementation of relevant laws and regulations, including those governing environmental solid-waste pollution prevention, urban appearance and sanitation management, and the management of municipal domestic waste*. Management focus will be shifted from the current end management to whole-process management, i.e. reduction of waste from the source, recovery and utilization, and non-hazardous disposal. Waste production and disposal processes will be normalized to the greatest possible extent, and the disposal of municipal domestic waste will be incorporated into the overall city planning process.

- *Further improving relevant sectoral standards*. Compulsory standards for waste classification and recovery will be formulated in accordance with

evolving requirements, so as to improve the comprehensive utilization of waste resources and reduce the amount of waste beginning from the source. The current sectoral standards for the classification and assessment of municipal domestic wastes, technical norms for sanitary domestic waste landfills, and standards for the assessment of non-hazardous domestic waste landfills, will be implemented more strictly and further revised, so as to improve the recovery and utilization of combustible gas from landfills and reduce landfill methane emissions.

– *Reinforcing technological development and deployment.* Great efforts will be made to develop and disseminate advanced waste-incineration technology and to localize relevant technologies, in order to decrease the cost and promote the industrialization of waste-incineration technology. Research will be carried out on landfill gas recovery and utilization technologies and composting technologies appropriate for China's circumstances and of suitable scale, thus providing small and medium-sized cities as well as rural areas with urgently needed waste-disposal technology. Greater support will be provided to the research, development, demonstration and dissemination of relevant technologies, and the development of waste disposal and comprehensive utilization technologies will be accelerated.

– *Making full use of the guiding function of industrial policy.* A fee system for disposal of domestic waste will be established in accordance with industrial policy, and measures such as charging fees for sanitary services, systems of contracted economic responsibilities, and enterprise management of public entities will be implemented. These will promote the reform of the waste-disposal system, and improve the current dispersed approaches to waste collection and utilization, thus promoting the industrial development of waste disposal.

– *Formulating incentive policies for the recovery and utilization of landfill gas.* Enterprises will be encouraged to construct and operate landfill gas collection and utilization facilities. The fee level for waste disposal will be increased, landfill gas power and waste incineration power projects will enjoy preferential feed-in tariffs, and landfill gas recovery and utilization projects will enjoy preferential value-added tax and enterprise income tax relief and reduction for a certain period of time.

4.2 Key areas for adaptation to climate change

4.2.1 Agriculture

– *Continuing to improve agricultural infrastructure.* Measures in this regard include accelerating the construction of supporting facilities for large-scale water conservation irrigation areas; maintaining and promoting quality field engineering; upgrading aging electromechanical equipment; improving irrigation and drainage systems; continuing to expand demonstration of water-saving irrigation and develop pilot projects in major grain-production areas, dry-land water-conservation agriculture and demonstration projects on dry-land farming in arid areas; conducting small-scale hydraulic engineering focused on field irrigation and drainage projects, small-scale irrigation areas and watershed projects in non-irrigated areas for combating drought;

strengthening the control and restoration of medium- and low-yield fields subject to salinization and alkalinization in major grain-production areas; and accelerating the construction of water collection and utilization engineering in hill, mountain and other arid areas.

- *Promoting adjustment of agricultural structure and cropping systems.* Measures in this regard include optimizing regional agricultural arrangements; promoting the centralization of major agro-products to corresponding production areas in order to form industrial zones for such products and increase agricultural productivity; extending the planting areas of economic and forage crops; shifting cropping systems from dual food crop/cash crop structures to ternary food crop/cash crop/forage crop structures; and adjusting cropping systems to develop multiple cropping and raise multiple-cropping indexes.

- *Breeding stress-resistant varieties.* Measures in this regard include selecting and cultivating new and superior animal and crop varieties with high quality and yield potential, superior integrative stress resistance and wide adaptability; improve crop and variety arrangements; and select and cultivate stress-resistant varieties with specific abilities to resist drought, water-logging, high temperatures, diseases and pests.

- *Preventing aggravation of grassland desertification.* Measures in this regard include preventing further spread of desertification by developing artificial grassland, controlling grazing intensity, recovering vegetation, and increasing vegetation coverage of grassland; and strengthening the development of animal husbandry in the farm belt to improve animal-husbandry productivity.

- *Strengthen research on and development of new technologies.* Measures in this regard include developing new technologies and striving for greater progress in the areas of photosynthesis, biological nitrogen fixation, biotechnology, disease and pest prevention, stress resistance, and precision agriculture; continuing to implement seed and well-bred animal and fishery species projects; promoting the development of superior species bases for major crop, livestock and poultry breeds; and enhancing the extent of agricultural technology and increasing agriculture's ability to adopt new technologies.

4.2.2 Forests and other natural ecosystems

- *Formulating and implementing laws and regulations relevant to climate change adaptation.* Measures in this regard include accelerating the amendment of legislation governing forests and wildlife protection; drafting legislation governing nature reserves along with regulations on wetland protection; and adding and/or strengthening articles relevant to climate change adaptation, so as to provide a legislative underpinning for improving the capacity of forests and other natural ecosystems to adapt to climate change.

- *Strengthening the protection of existing forest resources and other natural ecosystems.* Measures in this regard include strictly protecting natural forests in logging-ban areas, so as to turn natural-forest ecosystem conditions from deterioration to progressive improvement; conserving wetlands by effectively reducing human disturbance and damage, so as to arrest wetland-area decline; expanding the total area and improving the quality of nature reserves and

developing biocorridors among reserves; strengthening forest-fire control by establishing comprehensive systems for fire forecasting, monitoring, suppression, assistance, brush clearance and hazard assessment; effectively integrating existing forestry monitoring systems into an inclusive whole for forest resources and other ecosystems; and enhancing forest insect and disease control by improving systems for forecasting, early warning, monitoring and quarantining of forest insects and diseases, enhancing comprehensive controls, and broadening biological controls.

– *Strengthening the development and extension of technology*. Measures in this regard include researching and developing technologies for forest fire control and forest insect and disease control; selecting and breeding tree species with high resistance to cold, drought, pests and disease, so as to enhance the capacities of forest vegetation to adapt to climate change; developing technologies for biodiversity conservation and restoration, particularly those related to management of forest and wildlife nature reserves, wetland conservation and restoration, and conservation of endangered wild animals and plants, to mitigate the impact of climate change on biodiversity; promoting technologies for monitoring forest resources and ecosystems, including those for forest environments, desertification, wild animals and plants, wetlands, forest fires, pests and diseases; and improving monitoring networks and management systems to enhance forecasting, early warning, and emergency-response capacities.

4.2.3 Water resources

– *Enhancing water resource management*. Measures in this regard include adopting the principle of harmony between human and nature in water resource management, through greater efforts to reclaim farmland for lakes or river courses, remove polder dikes for floodways, dredge river channels and lakes, and rehabilitate and protect rivers with serious ecological problems, while strengthening dike construction and key water-control projects; enhancing unified management of water resources through basin-wide integration of water-resource planning, allocation, and management; paying more attention to the conservation, protection, and optimized allocation of water resources; changing traditional views of water resources as inexhaustible; converting approaches to water resource allocation from demand-based supply to supply-based demand; establishing national initial water-rights allocation and transfer systems; and developing investment, financing and management systems for key water-conservancy projects consistent with the socialist market economy.

– *Strengthening infrastructure planning and construction*. Measures in this regard include accelerating construction of the South-to-North water diversion project and gradually generating a new pattern of optimized water-resources allocation via three water diversion lines linking the Yangtze, Yellow, Huaihe and Haihe Rivers; enhancing the construction and improvement of key water-control projects (such as reservoirs) and infrastructure in irrigation areas; and continuing development of regional water storage and diversion projects.

– *Promoting the development and extension of technologies for water allocation and conservation and the utilization of seawater*. Measures in this regard

include focusing research on exchange mechanisms among atmospheric, surface, soil, and groundwater, and on technologies for optimizing water resource configuration, wastewater and rainfall utilization, and artificial rainfall enhancement; exploiting technologies for industrial water recycling, water-conserving irrigation, dry-land farming and biological water conservation, especially technologies and equipment for precise irrigation and intelligent management of agricultural water use; and developing and extending technologies for domestic water conservation and seawater utilization.

4.2.4 Coastal zones and coastal regions

- *Establishing and improving relevant laws and regulations.* Measures in this regard include formulating regional management regulations and detailed rules in accordance with legislation governing marine environmental protection and the administration of sea areas, and with the specific conditions of localities in the coastal areas; establishing integrated coastal zone management (ICZM) systems, comprehensive decision-making mechanisms and effective coordination mechanisms; promptly handling various issues arising in connection with the development and protection of coastal zones; and establishing integrated management demonstration sites.

- *Promoting the development and extension of technology.* Measures in this regard include strengthening research on and development of technologies for the protection and restoration of marine ecosystems, with emphasis on cultivation, transplanting, and recovery of coastal mangroves, and protection and restoration of coral reefs and coastal wetlands, in order to reduce the vulnerability of coastal-zone ecosystems; accelerating development of designated marine nature reserves, such as coral reef and mangrove reserves; and improving the capability to protect marine biodiversity.

- *Improving marine environmental monitoring and early warning capabilities.* Measures in this regard include setting up more observation sites and networks in coastal areas and on islands; constructing high-tech observation systems; improving aerial remote-sensing and telemetering capabilities for marine environments, especially for monitoring changes in sea level; developing early warning and response systems for tidal disasters in coastal areas; and promoting comprehensive early warning support capability, and strengthening the service capability of early warning systems as well as the production and distribution of early warning products, in order to increase marine disaster early warning capability.

- *Strengthening adaptation strategies to address rising sea levels.* Measures in this regard include adopting measures combining slope with shore protection and engineering with biological measures; raising design standards for sea-dike height, and heightening and consolidating existing sea-dike engineering works to enhance their capacity to handle rising sea levels; preventing over-exploitation of groundwater and land subsidence in coastal areas by artificially recharging groundwater in areas of land subsidence; taking such countermeasures as using fresh water from rivers or reservoirs to dilute and restrain brackish water against seawater incursions in estuaries; raising protection standards for coastal cities and major projects, for designed height

of port docks, and for adjusting outlet depths; and making efforts to construct multi-species, multi-layer, and multi-functional forest coastal shelterbelt systems.

4.3 Science and technology related to climate change

– *Strengthening macro-management and coordination for climate change-related scientific research.* Measures in this regard include seeking better understanding of the implications of climate change-related scientific and technological research; complying with the guiding principle of "making independent innovations, achieving breakthroughs in key areas, supporting development, and guiding future trends" in scientific research; meeting the requirements of the Framework National Programme for Medium- to Long-Term Scientific and Technological Development in climate change-related scientific research; strengthening macro-management and policy guidance for scientific and technological research on climate change; refining leadership and coordination mechanisms for scientific and technological research on climate change; improving the regional and sectoral allocation of climate change-related scientific research; further reinforcing support to climate change-related scientific research; accelerating the integration of climate change science and technological resources; encouraging and supporting innovation in climate change science and technology; and bringing science and technology into full play as the basic supporting force in the response to climate change.

– *Promoting scientific research and technological development in key areas of climate change.* Measures in this regard include strengthening research on scientific facts and uncertainties, the impact of climate change on social economy, analysis of the effectiveness of socio-economic benefits and costs in response to climate change, and technological options and effectiveness assessment in responding to climate change; strengthening the observation of climate change, research on and development of global climate-change monitoring technology, technology for reducing greenhouse gas emissions, and technological adaptation to enhance China's capacity to respond to climate change and implement the UNFCCC; and paying special attention to research on and development of large-scale and precise climate-change monitoring technology, energy efficiency and clean-energy technology, emission controls and utilization technology for carbon dioxide, methane and other greenhouse gas emissions in key sectors, biological carbon-capture technology, and carbon sequestration technology.

– *Strengthening the development of talent in the area of climate-change science and technology.* Measures in this regard include strengthening personnel training; establishing effective incentive and competition mechanisms and a favourable academic environment for talent development; emphasizing the fostering of academic leaders and eminent candidates with international vision and the ability to lead climate change studies, and encouraging talented young people to distinguish themselves; strengthening the disciplinary development of climate-change science; accelerating the assembly and integration of talent teams; establishing an "opening, flowing, competitive, and cooperative" operating mechanism for climate-change research institutes; making full use of

various channels and approaches to enhance the research ability and independent innovation capacity of China's scientists and research institutions; developing climate-change science and technology management teams and research and development teams in accordance with China's national circumstances; and encouraging and recommending China's scientists to participate in international research and development programmes on global climate change and to obtain positions in international research institutions.

– *Increasing financial support for climate change-related scientific and technological research.* Measures in this regard include establishing stable Government-funded channels as the main financing sources for broadening official financial support for climate change-related scientific and technological research; taking measures to ensure the full allocation and efficient utilization of Governmental investment; raising funds through various channels and by various means from all circles of society to support climate-change scientific and technological research; introducing venture-capital investment in the area of climate-change study; guiding businesses and enterprises to increase their investment in research on and development of climate-change science and technology, and giving them a role as a major source of technological innovation; and utilizing bilateral and multilateral funds from foreign Governments and international organizations to assist China's research on and development of climate-change science and technology.

4.4 Public awareness regarding climate change

– *Fully utilizing the promotional function of the Government.* All levels of Government should regard raising public awareness as an important task in addressing climate change, and carry it out with care. For this purpose, China will take various measures to promote the climate-change awareness of Government officials at all levels, as well as decision-makers at enterprises and institutions, to develop, step by step, high-quality leadership teams with strong awareness of global climate change. Furthermore, all levels of society will be fully employed to disseminate China's efforts and policies for responding to climate change and to promote public awareness of climate change.

– *Reinforcing publicity, education and training on climate change.* Measures in this regard include making full use of mass media, such as books, newspapers, periodicals, and audio and video products, to disseminate knowledge of climate change to stakeholders in all walks of life; advocating sustainable lifestyles that include the conservation of electricity and water and the sorting, reduction, recycling and reuse of garbage; incorporating climate-change publicity and education into the educational framework at the basic, adult and higher levels as an important component of China's overall system of quality education; holding various thematic training seminars, targeting a variety of audiences, and organizing workshops on both popular and professional climate-change science; and taking full advantage of information technology to enrich the content and functions of the Government's climate-change information websites, and developing them into real, responsive and effective platforms for information dissemination and communication.

- *Encouraging public participation.* Measures in this regard include establishing incentive mechanisms to encourage the public and enterprises fully to participate in and oversee the climate-change issue; improving channels and systems for information and publicity on climate-change issues; broadening the channels for public participation and supervision; giving full play to the media's public-opinion oversight and guidance function; increasing the transparency of decision-making on climate-change issues; promoting science and democracy in the area of climate-change management; and giving full play to the initiatives of social groups and non-governmental organizations.

- *Reinforcing international cooperation and communication.* Measures in this regard include strengthening international cooperation on promoting public awareness regarding climate-change issues; utilizing the experience of international best practices in the area of climate-change publicity and education; actively carrying out information exchange with foreign countries and exchanging publications, movies, television programmes, audio and video tapes and written works on global climate change; and developing public databases on climate change and providing inquiry-response and information-retrieval services for domestic agencies, research institutions, and schools.

4.5 Institutions and mechanisms

- *Strengthening leadership for addressing global climate change.* The response to climate change correlates with economic, social, domestic and foreign issues. Therefore, the State Council has established a National Leading Group to Address Climate Change, headed by Premier Wen Jiabao, with Vice Premier Zeng Peiyan and State Councillor Tang Jiaxuan serving as Deputy Directors of the Group. The Leading Group will deliberate on and determine key national strategies, guidelines and measures related to climate change, as well as coordinate and resolve key issues in that regard. The Office of the Leading Group, whose capacity will be strengthened, has been established within the National Development and Reform Commission. Relevant ministries and departments of the State Council will sincerely fulfil their responsibilities, and strengthen coordination and cooperation, so as to achieve synergies for addressing climate change. Local governments at all levels will enhance their organization and leadership with regard to local responses to climate change, and formulate and implement local climate change programmes as a matter of priority.

- *Establishing a regional administration system for coordinating the response to climate change.* Measures in this regard include establishing regional administration agencies to fulfil and implement the national programme, and to organize and coordinate local activities and actions in response to climate change; developing local expert groups on climate change and initiating appropriate climate change policy and measures in accordance with local geographical climatic and economic conditions; and strengthening coordination between national and local governments to ensure the smooth implementation of relevant policies and measures in response to climate change.

– *Making effective use of the Clean Development Mechanism Fund (CDMF).* In accordance with the pertinent articles of *Measures for Operation and Management of Clean Development Mechanism Projects*, the Government of China will levy a certain proportion of the certified emission reductions (CERs) transfer benefits from CDM projects. The revenue collected will be used to establish the Clean Development Mechanism Fund to support the country's activities on climate change, such as climate change-related science and technology research, and raising national adaptation and mitigation capacities. The Clean Development Mechanism Fund will also play an active role in alleviating demand for funds in response to climate change, and guaranteeing the effective implementation of this national programme.

Part 5
China's position on key climate change issues and the need for international cooperation

Climate change, the impacts of which have been felt all over the world, is mainly caused by massive emissions of CO_2 and other greenhouse gases originating from developed countries since the industrial revolution. Broad international cooperation is necessary to address climate change. In order effectively to address climate change and implement this national programme, China is ready to strengthen international cooperation with all countries. Meanwhile, China would like to appeal to the developed countries sincerely to fulfil their commitments under the Convention to provide financial assistance and transfer technology to developing countries so as to enhance their capacity to address climate change.

5.1 China's position on key climate change issues

5.1.1 Mitigation of greenhouse gas emissions

Mitigating greenhouse gas emissions is an important component in addressing climate change. In accordance with the principle of "common but differentiated responsibilities" of the UNFCCC, the Parties included in Annex I to the Convention should take the lead in reducing greenhouse gas emissions. Achieving sustainable development is the priority for developing countries with lower historical emissions and low current per-capita emissions. As a developing country, China will stick to its sustainable development strategy and take such measures as improving energy efficiency, conserving energy, developing renewable energy, and preserving and developing the ecology, as well as large-scale tree planting and afforestation, to control its greenhouse gas emissions and further contribute to the protection of the global climate system.

5.1.2 Adaptation to climate change

Adaptation to climate change is an integral part of addressing climate change. In the past, sufficient attention was not given to adaptation, but it is now a required shift in direction. When formulating further legal documents to address climate change in the future, the international community should give full consideration to adaptation to the climate change already under way, especially the promotion of

developing countries' capacities to deal with extreme climatic events. For this purpose, China is ready to cooperate with the international community in joining actively in climate change adaptation activities and in drafting relevant legal documents.

5.1.3 Technology cooperation and transfer

Technology will play the central role in addressing climate change. International technology cooperation and transfer should be strengthened to share the benefits of technological development worldwide. Measures in this regard should include establishing an effective technology cooperation mechanism to promote research on and development, deployment and transfer of technology for addressing climate change; eliminating obstacles to technology cooperation and transfer arising from policies, institutions, procedures, financial resources and protection of intellectual property rights; initiating incentive measures for technology cooperation and transfer to ensure that it actually happens; and establishing a special fund for international technology cooperation so that environment- and climate-friendly technologies are accessible and affordable for developing countries.

5.1.4 Full implementation of commitments under the Convention and the Kyoto Protocol

The UNFCCC set out the objectives, principles and commitments for addressing climate change, on which basis the Kyoto Protocol further established specific greenhouse gas reduction targets for Annex I country Parties for the period from 2008 to 2012. All parties are supposed to faithfully implement their respective commitments under the Convention and the Kyoto Protocol. The developed countries should fulfil their commitments of taking the lead in reducing their greenhouse gas emissions and providing financial assistance and technology transfer to the developing countries. As a responsible country, China will sincerely fulfil its commitments under the Convention and the Kyoto Protocol.

5.1.5 Regional cooperation on climate change

The UNFCCC and the Kyoto Protocol are the major legal frameworks for the international community to address climate change, but they do not close the door to regional cooperation on climate change. Regional cooperation on climate change, in any form, should function as a helpful complement to the UNFCCC and the Kyoto Protocol rather than replacing or weakening them. The purpose of regional cooperation should be to stimulate all efforts to address climate change and to boost practical international cooperation. China will participate in regional cooperation on climate change in this way.

5.2 Requirements for international cooperation on climate change

5.2.1 Requirements for technology transfer and cooperation

– *Technological requirements for observation and monitoring of climate change.* The technological requirements for this purpose fall mainly in the areas of atmospheric observation, marine observation, terrestrial eco-observation, meteorological satellite technology, marine and terrestrial resources, and

climate-system simulation and calculation technology. Among these, technology for manufacturing advanced observation equipment, high-resolution and high-precision satellite operation, satellite data acquisition, and remote-sensing information collection and review, and high-performance climate-change simulation techniques are at the top of the list for China to establish its own climate observation system, and are the country's priority requirements for technology transfer and cooperation.

- *Technology requirements for mitigation of climate change*. China is at the stage of large-scale infrastructure construction, and is in urgent need of technology for reducing greenhouse gas emissions. China's technology requirements for mitigation of climate change mainly involve advanced energy production and utilization, environmental protection and comprehensive resource-utilization, high-efficiency transportation, new materials and new-style building materials. Priority requirements in this regard include technologies for high-efficiency low-pollution coal-burning power generation; large hydropower-generation units; new-generation nuclear and renewable energy; building-energy conservation; clean-fuel and hybrid vehicles; urban rail-based transport; fuel-cell and hydrogen energy; oxygen-rich coal-spray blast furnaces and long lifespan, comprehensive small and medium-sized nitrogen production-facility transformation and expansion; new paving materials, and new-type wall-body materials. Introduction and dissemination of these technologies in China will have a significant impact on the country's efforts to control greenhouse gas emissions.

- *Technology requirements for adaptation to climate change*. China's requirements for adaptation to climate change mainly include technologies for high-efficiency agricultural water conservation (such as spray and drip irrigation); industrial water conservation and reuse; industrial and household wastewater treatment; household water conservation; high-efficiency flood control; agro-biology; agricultural selective breeding; new-type fertilizer production; cropland, forest, and grassland disease and pest control; fast-growing high-yield forest and high-efficiency firewood forest cultivation; wetland, mangrove and coral reef ecosystems recovery and reconstruction; and flood, drought, rising sea level and agricultural-disaster observation and early warning modalities. Well-timed acquisition of these technologies can greatly help China reinforce its capacity for adaptation to climate change.

5.2.2 Requirements for capacity-building

- *Developing human resources*. Capacity-building requirements for the development of human resources mainly include personnel training, international exchange programmes, development of disciplines and professional training in the area of fundamental research on climate change, analysis of policies on mitigating and adapting to climate change, information systems development, and CDM project management.

- *Adapting to climate change*. Capacity-building requirements for adaptation to climate change mainly include development of climate-change adaptation projects, case studies on extreme climatic events, improvement of climate observation systems, and enhancing the adaptation capacity of coastal areas, water resources and agriculture sectors.

– *Technology transfer and cooperation.* Capacity-building requirements for technology transfer and cooperation mainly include following new international progress and trends in technological development, effective identification and assessment of advanced climate-change adaptation technology, analysis of barriers to international technological transfer and cooperation, and improving the ability to adapt to and assimilate transferred technologies.

– *Raising public awareness.* Capacity-building requirements in this area include developing medium- and long-term programmes and policies to enhance public awareness with regard to climate change, establishing professional publicity and education networks and institutions in line with international standards, training people working in media and climate-change education, launching public campaigns for stakeholders from different regions and groups to disseminate knowledge of climate change, and guiding public consumption patterns in favour of protecting the global climate system.

– *Developing information systems.* Capacity-building requirements in the area of information-system development include distributed databases on climate change, internet-based climate-change information-sharing platforms, application-oriented information and information-service systems, public and industrial information-service systems, and international information exchange and cooperation.

Setting up national information reporting. Capacity-building requirements in this regard include the establishment of statistical systems for compiling emissions inventories, collection of testing and monitoring data for emission factors, methodologies for inventory quality control, assessment of climate-change impact and adaptation, projection of future emissions, and the development and management of a national greenhouse-gas emission database.